

Entry: **C5**
 Machine Name: TRIUMF Cyclotron
 Address: 4004 Westbrook Mall, Vancouver BC Canada
 In Charge of the cyclotron: G. Dutto
 Tel: 604-222-1047
 Fax: 604-222-1074

Date: June 1998
 Institution: TRIUMF
 Web: www.triumf.ca
 E-mail: pearced@triumf.ca

HISTORY

Design by: In house, various eng. firms
 Construction time: 6 yrs
 First beam: December 1974

CHARACTERISTIC BEAMS

ions / energy (MeV/n) / current (pps) / power (W) :
 -p+ / 180-520 / 180 μ A
 -p+ / 65-100 / 100 μ A
 -p+ (pol) / 180-520 / 25 μ A
 transmission efficiency (total)
 - typical: 55-60 % - best: 60 %
 transverse emittance (rms)
 - vertical: 2 π mmmrad
 - horizontal: 2 π mmmrad
 longitudinal emittance (rms) 0.2 % $\Delta E/E$.degRF

USES

basic research: *86 % therapy: *2 %
 development: 2 % isotope production: *45 %
 other applications: % maintenance: 10 %
 beam tuning: 2 %
 total time: 5200 h/year
 (* - simultaneous operation)

TECHNICAL DATA

a) magnet type: sector focussed laminated low carbon steel
 Kb: MeV/A Kf: M²V/A
 average field (min-max): 0.30 - 0.46 T
 number of magnet sectors: 6
 - angle: 17.5 deg
 - spiral (max): 70.0 deg
 pole parameters
 - diameter: 17.17 m
 - injection radius: 0.25 m
 - extraction radius: 5.80 - 7.80 m
 hill gap: 0.528 m valley gap: m
 field trimming
 - trim coils
 - number: 55
 - current (max) 100 A
 - harmonic coils
 - number: 13
 - current (max): 100 A
 - others
 - number:
 - current (max): A
 main coils:
 - number: 1
 - Ampere-turns: 15 A.T.
 - current: 18400 A
 stored energy: MJ
 weight : - iron: 4400 t - coils: 170 t
 power
 - main coils (total): 1380 kW
 - trim coils (total max): 68 kW
 - refrigerator (cryogenic): kW

b) RF

- acceleration
 - frequency range: 23.05 MHz
 - harmonic modes: 5
 - number of dees: 2
 - angular aperture: 180 deg
 - voltage:- average (min-max): +/-96 to ground deg
 - variation with radius:
 - power in (max): 1100 kW
 - stability:- phase: +/- 5 deg - voltage: 0.0004 %
 - other cavities
 - purpose: auxiliary accel. cavity lambda/4
 - frequency range: 92 MHz

- region of influence: 7 - 7.75 m
 - voltage (max): 150 kV
 - power in (max): 60 kW
 - stability:- phase: +/- 5 deg - voltage: 0.0004 %

c) injection

- internal source:
 - external (radial/axial): axial injector
 - elements: spiral inflector, electrostatic transport
 - source voltage: kV
 - injection energy: 0.300 MeV/n
 - buncher: 2
 - injection efficiency: 65 - 70 %

d) ion sources/injector

Ehlers PIG, CUSP
 Polarized: Lamb shift, optically pumped

e) extraction

- elements, characteristics:
 - stripping in pyrolytic graphite foil
 - efficiency
 - typical: 99.95 % - best: %

f) vacuum

- pumps: 2 He cooled cryo-panels (2.8 m square),
 4-41 cm cryo-pumps, 1-46cm cryo-pump, 1-25 cm turbo
 - achieved vacuum: 5 x 10⁻⁸ Torr Pa

REFERENCES

EXPERIMENTAL FACILITIES

Proton Therapy
 Radioactive Ion Source and Accelerator (ISAC) under construction, transfer...
 line complete.

PLAN VIEW OF FACILITY

